UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/998,284	11/30/2001	Charlotte Horsmans Poulsen	674523-2012	5487

27890 7590 04/25/2008
STEPTOE & JOHNSON LLP
1330 CONNECTICUT AVENUE, N.W.
WASHINGTON, DC 20036

EXAMINER	
CARLSON, KAREN C	
ART UNIT	PAPER NUMBER
1656	
MAIL DATE	DELIVERY MODE
04/25/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	09/998,284	POULSEN ET AL.	
	Examiner	Art Unit	
	Karen Cochrane Carlson, Ph.D.	1656	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 February 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3,9-15,34,35 and 40-50* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3, 9-15, 34, 35, and 40-50* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Art Unit: 1656

This Office Action is in response to the Appeal Brief filed February 19, 2008.

Upon review of the prosecution of this application for patent, this Examiner prefers to bring together the rejections found across several Office Actions into a single Office Action so that if/when this action is appealed to the Board again the contents of the rejections will be found in a single Office Action.

Claims 1-3, 9-15, 34, 35, and 40-50 are currently pending and are under examination.

Benefit of priority is to June 2, 2000.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 11-14, 34, 35, 40, 41, 42, 44, 45, 48, 49, and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hamade et al. (September 23, 1998; EP O 866103 A1).

At page 3, lines 39-41, Hamade et al teach that the compound having antimicrobial activity may be a compound obtained as the direct result of enzymatic reaction between the enzyme and the substrate OR *the compound having antimicrobial activity may be a compound formed from the product of such enzymatic reaction through further enzymatic reaction*.

At page 3, lines 51-53, the compound having antimicrobial activity includes hydrogen peroxide. At page 5, lines 14-16, Hamade et al. teach that the enzyme-substrate combination capable of producing hydrogen peroxide is not particularly restricted by preferable includes a combination such that the enzyme is an oxidase and the compound is oxidized by said oxidase. At page 5, line 18, the combination of oxidases and substrate include hexose oxidase-glucose. At line 57 on page 5, and at line 2 on page 6, the enzyme may be immobilized (re: Claim 11).

Therefore, to summarize these teachings of Hamade et al. as these teachings relate to instant Claim 1:

Enzyme1 + Subtrate1→ Glucose (Substrate2) + Hexose Oxidase (Enzyme2)→ Hydrogen Peroxide (Anti-fouling compound)

Hamade et al. teach to place the enzyme-substrate into a surface coating composition, comprising a film forming resin, an enzyme, and substate, wherein the enzyme is capable of reacting with said substrate to produce a compound having antimicrobial activity. The film-forming resin includes acrylic resins, vinyl chloride resins, and the like (see page 6, lines 25-36).

At page 7, top, Hamade et al. teach to place the coating onto interior walls and floors of hospitals, schools, and hotels, and at line 15, placing the coating onto the bottom of ships, sea port facilities, buoys, pipelines, bridges, moorings, and so on to protect against fouling (line 18).

Therefore, It would have been obvious to a person having ordinary skill in the art to make an antifouling composition comprising a surface coating material (film forming resin or coating (**Claim 41**)), a first enzyme and first substrate to make a product (second substrate) which undergoes further enzymatic reaction to form the antimicrobial/antifouling compound , wherein

the further enzymatic reaction is derived from an oxidase (second enzyme) to make hydrogen peroxide (antimicrobial/antifouling agent; **Claim 1, 11, 12, 13, 14, 48, 49**) because Hamade et al. teach that a compound having antimicrobial/anti-fouling activity may be a compound formed from the product of a first enzymatic reaction through a further second enzymatic reaction, and that the compound is hydrogen peroxide as a product of the reaction between hexose oxidase (**Claim 40, 44**) and glucose (**Claim 34, 35**), where in the surface coating material includes acrylic resins, vinyl chloride resin, and the like (**Claim 42**).

It would have been obvious to a person having ordinary skill in the art to place this anti-fouling composition onto the surface of a vessel because Hamade et al. teach that placing this composition onto the bottom of ships will protect the ships against fouling (**Claim 50**).

Claims 2, 3, 40, 43, 44, and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hamade et al. (September 23, 1998; EP O 866103 A1) as applied to claim 1 above, and further in view of Hansen et al. (1997; Hexose oxidase from the red alga *Chondrus crispus*. Journal of Biological chemistry 272 (17): 11581-11587).

The teachings of Hamade et al. are set forth above. Hamade et al. teach to use the combination of the enzyme hexose oxidase and substrate glucose to make the antimicrobial/antifouling compound hydrogen peroxide. Hamade et al. do not teach the origin of the hexose oxidase.

Hansen et al. teach recombinant production of red alga *Chondus crispus* hexose oxidase. Hansen et al. teach that this hexose oxidase catalyzes the oxidation of glucose. The amino acid sequence of this hexose oxidase is the same as that set forth in SEQ ID NO: 2.

It would have been obvious to one having ordinary skill in the art to include the hexose oxidase found in the red alga (**Claim 2, 47**) *Chondrus crispus* (**Claim 3**) having the amino acid sequence set forth in SEQ ID NO: 2 (**Claim 40, 43, 44**) taught by Hansen et al. in the composition

comprising hexose oxidase taught by Hamade et al. because Hamade et al. teach to use the combination of hexose oxidase and glucose for the production of the antimicrobial/anti-fouling compound hydrogen peroxide and the hexose oxidase of Hansen et al. is a useful art-recognized equivalent in the catalytic conversion of glucose to hydrogen peroxide.

Claims 9, 10, 14, 45, and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hamade et al. (September 23, 1998; EP O 866103 A1) as applied to claim 1 above, and further in view of James et al. (1997; Glucosamylases: Microbial sources, industrial applications, and molecular biology – A review. Journal of Food Biochemistry 21: 1-52).

The teachings of Hamade et al. are set forth above. Hamade et al. teach to use the combination of the enzyme hexose oxidase and substrate glucose to make the antimicrobial/antifouling compound hydrogen peroxide. Hamade et al teach that the compound having antimicrobial activity may be formed from the product of such enzymatic reaction through further enzymatic reaction. Hamade et al. do not specifically teach this "precursor enzymatic reaction" (Enzyme 1 and Substrate 1) that will produce the glucose that the hexose oxidase will catalyze to make hydrogen peroxide.

James et al. present a review article on glucoamylases, also known as amyloglucosidases (page 2, line 2). Amyloglucosidases use starch as a substrate for the production of glucose (see page 2+). James et al. discusses the industrial applicability of amyloglucosidases in the manufacture of food products (see page 17+).

It would have been obvious to a person having ordinary skill in the art to include amyloglucosidase (**Claim 9**) and starch (**Claim 10, 45, 46**) as taught in James et al. in the composition of Hamade et al. because Hamade et al. teach that the compound having antimicrobial/anti-fouling activity may be formed from the product of such enzymatic reaction

through further enzymatic reaction of hexose oxidase and glucose, and James et al. teach that an enzymatic reaction producing glucose is the catalysis of starch by amyloglucosidase.

Therefore, to summarize the teachings of Hamade et al. and the teachings of James et al. as these teachings relate to instant Claim 1 and dependent claims 9, 10, 14, 45, and 46:

Amyloglucosidase (Enzyme1) + Starch (Subtrate1)→ Glucose (Substrate2)

Glucose (Substrate2)+ Hexose Oxidase (Enzyme2)→ Hydrogen Peroxide (Anti-fouling compound)

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combined teachings of Hamade et al. (September 23, 1998; EP O 866103 A1) and James et al. (1997; Glucosamylases: Microbial sources, industrial applications, and molecular biology – A review. Journal of Food Biochemistry 21: 1-52) as applied to claims 1 and14 above, and further in view of Hamade et al. (June 23, 1998; USP 5,770,188).

The teachings of Hamade et al. (EP O 866103 A1) and James et al. are set forth above. The combined teachings of Hamade et al. and James et al. do not teach that the anti-fouling composition is self-polishable.

Hamade et al. (USP 5,770,188) teach that anti-fouling paint compositions comprising lipid encapsulated glucoamylase (amyloglucosidase) and starch are self-polishing (See col. 4, line 30-35; col. 6, line 31; Col. 7, lines 9-11). The advantages of composition comprising lipid coated enzyme include the retention of high activity in organic solvents, durability, and good stability in paint and pain films, and the retention of anti-fouling property over long periods of time without adversely affecting the environment (Col. 2, para. 5).

It would have been obvious to a person having ordinary skill in the art to encapsulate the amyloglucosidase in lipid in the anti-fouling composition rendered obvious by the teachings of Hamade et al. (EP O 866103 A1) and James et al. because Hamade et al. (USP 5,770,188) teach

that the combination of encapsulated glucoamylase (amyloglucosidase) and starch render anti-fouling paint compositions self-polishing (**Claim 15**).

While the rejections above are new, the references cited are not. Therefore, The Examiner will address a few of Applicants arguments presented in the Appeal Brief that are specific to the primary reference at this time.

Applicants argue in the Appeal Brief at page 5 that Hamade et al. discloses a composition comprises a single enzyme and a single substrate to be selected from a list of enzymes and substrates. Applicants cite the same passage of Hamde et al. that discloses the use of a composition comprising two enzymes and two substrates to make an anti-fouling composition: the compound having antimicrobial activity may be a compound obtained as the direct result of enzymatic reaction between the enzyme and the substrate OR *the compound having antimicrobial activity may be a compound formed from the product of such enzymatic reaction through further enzymatic reaction*. Thus, it is unclear why Applicants state that Hamade et al. does not teach or suggest the instantly claimed invention. See the explanation and diagrams presented above regarding how this teaching is used to arrive at claimed invention.

No Claims are allowed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Karen Cochrane Carlson, Ph.D. whose telephone number is 571-272-0946. The examiner can normally be reached on 7:00 AM - 4:00 PM, off alternate Fridays.

Art Unit: 1656

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dr. Kathleen Kerr Bragdon can be reached on 571-272-0931. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Karen Cochrane Carlson, Ph.D./
Primary Examiner, Art Unit 1656